ABSTRACTS

58.05
Astrometry Capability
W. Jefferys (U. Texas)

58.06
The Point Object Camera
F. Marchetto (STScI)

58.07
The Wide Field/Planetary Camera
J. Westphal (Caltech)

Session 59: Solar Dynamo
Oral Session, 10:00–11:30 am
Acoma

59.01
Solar Cycle Effects on Solar Oscillation Frequencies
K. G. Libbrecht (Big Bear Solar Observatory, Caltech)

I will discuss recent advances in the field of helioseismology, with emphasis on the observational program now underway at Caltech's Big Bear Solar Observatory. I will describe the measurement techniques we are using, and present results based on two helioseismology data sets acquired at BBSO during the summers of 1990 (close to solar minimum) and 1988. Each of these data sets consists of roughly 60,000 full-disk Doppler images of the sun, accumulated over a four-month time span. With these data we are able to make extremely precise measurements of the Sun's p-mode frequencies and frequency splittings. These data clearly show that solar p-mode frequencies change with time, and that the measured frequency shifts \( \Delta \nu = \nu_{68} - \nu_{66} \) range from \( \Delta \nu < 10 \) mHz for the lowest frequency modes (\( \nu \approx 1 \) mHz), to \( \Delta \nu \approx 300 \) mHz at \( \nu = 4 \) mHz. This measured frequency dependence is expected if the effective sound speed perturbation from solar activity is located predominantly near the solar surface. The even-coefficient p-mode frequency splittings show a similar frequency dependence, and latitude inversions of the frequency shifts and splittings confirm that the effective sound speed perturbation from solar activity is concentrated in the active latitudes. I will discuss work currently underway to invert the frequency shift measurements to determine the structure of solar activity as a function of depth.

59.02
Solar Dynamo Theory: Current Problems and Future Prospects
E. E. DeLuca (Univ. of Chicago)

Magnetic fields in the sun are maintained by a complex set of interactions between different physical processes, e.g., convection, rotation, turbulent diffusion, the Lorentz force, magnetic buoyancy, penetrative convection. Progress in our understanding of the solar dynamo depends on our understanding of the basic physics of these problems. Recent approaches to different sub-problems will be presented and the prospects for future progress will be discussed.

Session 60: Solar Flares II: Chromospheric Response
Oral Session, 10:00–11:30 am
Cochiti

60.01
"Chromospheric Response During the Gamma Ray Flare on March 10, 1989"
J.-P. Wüster, R.C. Canfield (U. Hawaii), and E. Rieger (MPI Garching)

On March 10, 1989 a gamma ray burst occurred during a large X4.6/3B flare in AR 5395. It is the first gamma-ray event for which we have combined GRS and IXXRB observations from the Solar Maximum Mission and Hα imaging spectroscopy observations from the National Solar Observatory/Sacramento Peak. The impulsive hard X-ray and gamma ray emission occurred about 20 minutes after the onset of the large flare. However, this new energetic emission did not originate in the large flare itself, but marked the beginning of a separate 2B flare in the same active region. This is evidenced by the excellent temporal correlation between Hα, hard X-rays, and gamma rays.

The hard X-rays between 50 and 200 keV showed three bursts of comparable intensity within a time interval of about 30 s. The third of these bursts was very unusual at high photon energies: a strong gamma ray continuum up to 50 MeV was observed, but without significant emission from nuclear lines. The main gamma ray emission lasted for about 6 s. The Hα flare emission increased steadily throughout the hard X-ray burst. But several H-alpha kernels showed a very impulsive brightening, and a simultaneous maximum of the downward velocity immediately after the gamma ray burst. These signatures are expected after explosive chromospheric heating by energetic electrons. We have Hα line profile data from a few seconds before and after, but not during the 6 s interval of strongest gamma ray emission. The absolute amplitude of the observed line profiles was not unusually high. Some profiles showed broad wings, but they cannot be uniquely attributed to intense deep chromospheric heating because of the effect of high coronal pressure on the Hα line profile. The chromospheric heating and cooling time scales during flares are so short that such intense and broad profiles are not expected even a few seconds after the end of the heating. Only dynamic phenomena persist for a significantly longer period of time.

60.02
Development of Kernels in a Two-Ribbon Subflare
V. Gaizauskas, M. Proulx (HTA/NEOC), A.P. Skumanich (HAO)

We have digitized high-resolution filtergrams of a subflare observed jointly with OSO-8 on 19 April 1977. From filtergrams taken sequentially in 15 different positions of the Hα line we can derive a line profile for any clump of pixels in the 4'×3' field of view over the range ±1.4 Angstroms every 42 s during the flare. The dynamic range of our digitizing system is large enough that typical flare ribbons are resolved into clumps of compact (~2'-3') intense kernels embedded in a weaker emitting halo which outlines each ribbon.

Our preliminary findings show that new kernels continue to appear in Hα after the impulsive phase of the flare. We shall report on time developments of spectra and positions of individual kernels which indicate that energy release continues many minutes after the impulsive phase.